

Next we describe the procedure to check and correct the alignment of the fiber at the Front End Module.

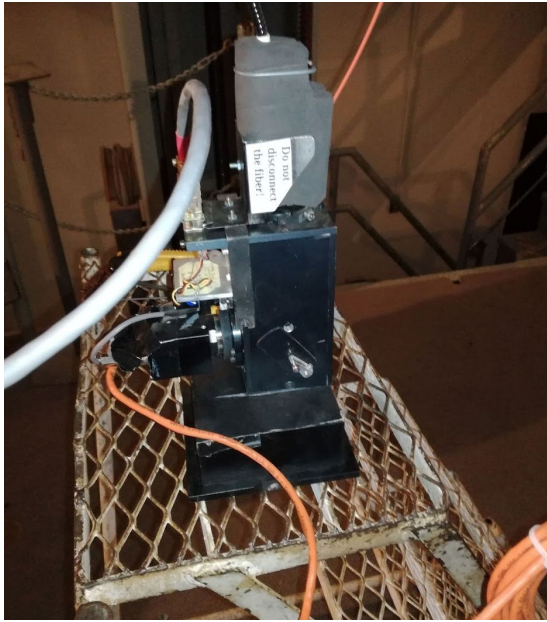
The **Front End Module** (hereafter FEM) is located at the GAM (Guiding Acquisition Module) of the 1.5m telescope, this is, at the base of the telescope, and to its North side. It is fixed in its place using a metallic “eyelash” fixed with a ¼” Allen bolt and 2 orthogonal supports. In the picture below, we can see the bolt (right hand picture). The two orthogonal supports are at the left side of the FEM, over the wall of the GAM (left hand picture.)

For this work we will need:

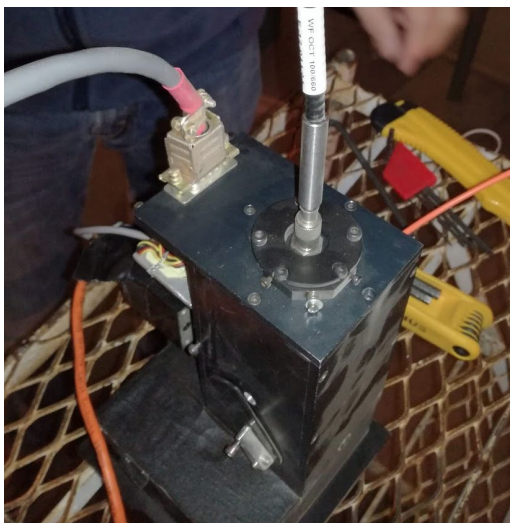
- A flashlight
- A piece of paper
- An ¼” Allen key
- An M2, M2.5 and M3 Allen keys
- The 1.5m metallic escalator to be used as a work surface.



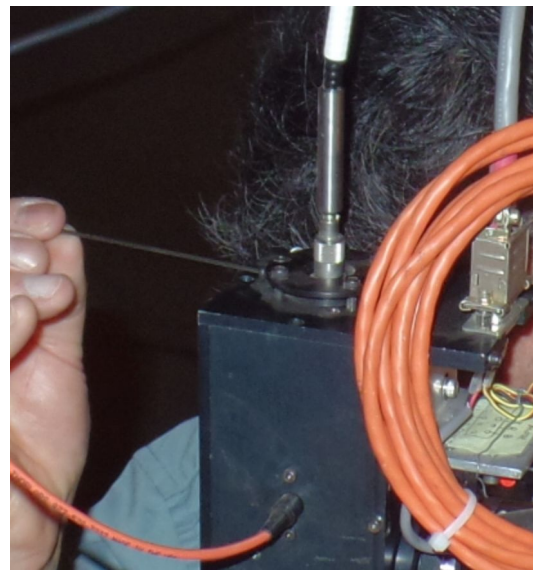
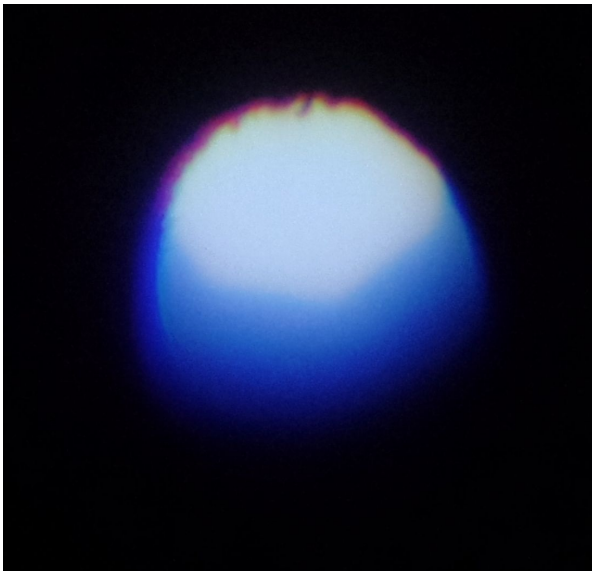
1. First, in the coude room, remove the eyepiece and replace it by the flashlight. Use a piece of paper to attenuate that light. At the left side of the eyepiece, there is a metallic piece that you must move UP in order to install in place a mirror that interrupts the light path from the fiber to the shutter and in this way, now we are illuminating the fiber.
2. Raise the platform until you can see the FEM at a level that is easy for you to work on it.
3. Install the metallic escalator near you.
4. Carefully remove the cable tie that holds the orange optical fiber (used for calibrations) located at the left hand of the FEM.



5. Either ask for help or use your left hand to hold the FEM and now use the 1/4" Allen key to lose the Allen bolt right of the FEM. Do not fully remove the bolt, we just need to release the lock so we can carefully remove the FEM.
6. Once released, carefully install it on the upper surface of the metallic escalator.
7. Loose the two lateral M2.5 screws that hold the metallic support of the fiber's protective foam.
8. Remove the metallic U-ring that holds the protective foam around the fiber. At the right hand of the FEM, there is a screw that, once released (with the hand), allows to flip a movable cover thus revealing a small hole which allows us to watch the reflection of the illuminated fiber.



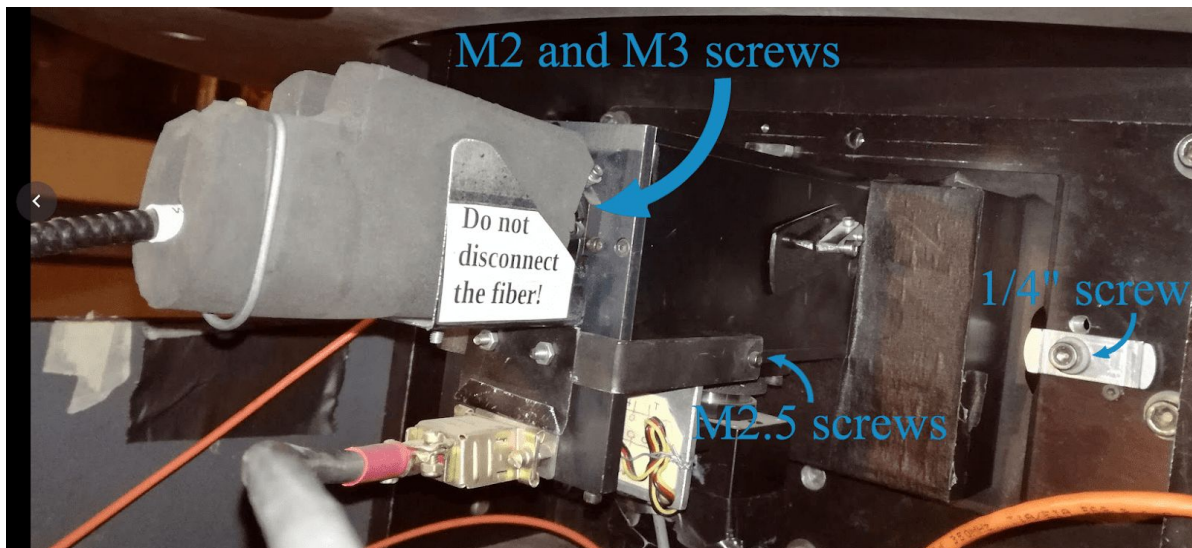
9. At the top of the FEM there are three M3 Allen screws that hold in place the metallic ring around the fiber. And, around that plane there are two orthogonal M2 Allen screws which allow to align the fiber in the X and Y axes.
10. In order to align the fiber, the first step is to loose (but not to remove!) the three M3 screws that hold the fiber in place. In the left picture below, we can see the blurred, misaligned image of the hexagonal fiber. Once the three M3 screws are loose, look through the hole and using the M2 Allen key, align one and then the other axis until we get a centered well illuminated hexagon.



11. Once done, carefully tight the three M3 screws and check we have not lost the fiber alignment. Keep in mind, this is an iterative procedure. Once the three M3 screws are in place, replace the protective foam and its U-ring holder. Now we are ready to replace the FEM to its port in the GAM.
12. Before reinstalling the FEM, have a look through its port at the GAM. We can see the **pick-off** mirror used both by the FEM as well as by the guiding camera. This is a good opportunity to clean the pick-off mirror using the CO2 nozzle at low pressure.
13. In the next page, at the upper left hand picture, we see the pick-off mirror (M3) as seen through the FEM port at the GAM, and the base of the FEM (the side that is usually against the GAM.) Also, in the left hand picture, note the two orthogonal stops used to install the FEM. First we place the FEM left side against these two stops and on the GAM wall, and then put in place the metallic eyelash and tight the $\frac{1}{4}$ " Allen bolt.
14. In the next page, at the right hand picture, we can see the base of the FEM and inside we see the small mirror we use to watch the image of the illuminated fiber in this alignment process.



Finally, in the next picture we can see the FEM installed over its port at the GAM. Also, in the picture we show the location of the screws we need to touch through all this alignment procedure.



This document was written by Roberto Aviles under the guidance of Dr. Andrei Tokovinin and as a result of the fiber alignment work done by Dr. Tokovinin on Friday October 23, 2020.

Cerro Tololo, October 25th, 2020

